

TA-55

Design Specification

Document number: TA55-SPEC-009,R0

Effective date: 09/21/2006

Expiration date: 09/21/2009

Supersedes: NA

Title: Procurement Specification for the New Generation Standard Nuclear Material Container

Status: ☒ New ☐ Major revision ☐ Minor revision ☐ Reviewed, no change

Derivative Classifier

Signature: SIGNATURE ON FILE

Printed Name: Tim Stone, TSM

Date

09/21/2006

☒ Unclassified

☐ UCNI

☐ Classified

	<u>Organization</u>	<u>Date</u>	<u>Signature</u>
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History of Revisions

Document Number	Effective Date	Action	Description
TA55-SPEC-009,R0	09/21/2006	New	New

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Procurement Specification for the New Generation Standard Nuclear Material Container

1.0 Introduction

1.1 Overview This document represents the procurement design specification for the New Generation, Standard Nuclear Material Container (NG SNMC).

1.2 Purpose The NG SNMC represents the primary packaging system for interim storage of radioactive materials at TA-55, PF-4, which ensures worker protection, public health and safety, and environmental protection. Nuclear material shall be packaged to ensure that no radiological contamination above the levels allowed in storage areas shall breach the package during interim storage.

This specification establishes the design and procurement requirements to ensure an adequate barrier exists between the public and nuclear materials stored in the NG SNMC outside of an approved, engineered-containment barrier (e.g., outside of a glovebox).

1.3 Scope This procurement specification defines the performance criteria the Supplier applies to design development, prototype testing, and fabrication activities. The Technical Representative approves the Supplier's design, fabrication, and test documents, which shall become an extension to the requirements stated in this specification.

1.4 Definitions

Term	Definition
Approved Supplier	A supplier whose management and operations have been evaluated in accordance with approved procedures and found to be capable of assuring the specified quality of items or services being requested in a procurement document (i.e., also referred to as "Qualified Supplier").

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1.0 Introduction, Continued

Term	Definition
Requester	Los Alamos National Laboratory, Plutonium Management and Technology Division, Nuclear Material Management Group
Institutional Evaluated Suppliers List	A list indicating acceptability of suppliers whose quality management systems have been evaluated for their capability to supply items or services in accordance with established requirements. The IESL is maintained by PS-1.
Interim Storage	Storage outside an engineered boundary longer than five days but not more than 20 years.
Item	An all inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, or unit.
Management Level	The LANL classification system for determining that the management control applied to each facility/project element or deliverable is consistent with its intended performance, complexity, governing codes, standards or regulatory requirements, mission, importance, environmental consequence, and safety and health risks.
Specification	A description of or performance expectations and quality requirements for items or services. Specifications may be standard specifications for engineered items, drawings, or in the form of instructions detailed to ensure form, fit, function, and intended performance.
Supplier	Any individual or organization that furnishes items or services in accordance with a procurement document. An all-inclusive term used in place of any of the following: vendor, Supplier, contractor, subcontractor, fabricator, consultant, and their sub-tier levels.

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1.0 Introduction, Continued

Term	Definition
Technical Requirement	The characteristics, performance capabilities, etc., which define the critical characteristics (the necessary and sufficient salient features of an item) to ensure that the item will meet functional requirements. Technical requirements for services describe the conditions for the service or product to be provided.
Surrogate Material	That material representing 100% of the nuclear material that does not include other dunnage within the containment boundary such as cellulose or plastics.
Certificate of Conformance (CoC)	A supplier's certification that is traceable to the shipment, the items, or materials and states that the materials conform in all respects with the purchase order requirements. This certificate is signed or otherwise authenticated by the supplier's authorized representative. The CoC is signed and authenticated by the responsible person within the manufacturing organization and certifies the conformance of all items shipped to purchase order requirements.
Certified Material Test Report	This document accompanies material (stainless steel etc.) ordered from the mill certifying that the material has been tested and found to be in compliance with the published requirements for that material. The Certified Material Test Report lists chemical analyses and mechanical tests of specific heat and coil numbers. These numbers are certified by the mill lab manager.

1.0 Introduction, Continued

1.5 Acronyms

Acronym	Definition
ALARA	As Low As Reasonably Achievable
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
C of C	Certificate of Conformance
CMTR	Certified Material Test Reports
DR	Damage Ratio
DOE	Department of Energy
IESL	Institutional Evaluated Suppliers List
LANL	Los Alamos National Laboratory
ML	Management Level
MNOP	Maximum Normal Operating Pressure
NG SNMC	New Generation Standard Nuclear Material Container
NQA-1	ASME Quality Assurance Program Requirements for Nuclear Facilities
PMT	Plutonium Management and Technology
PQR	Procedure Qualification Report
QAP	Quality Assurance Program
QAPP	Quality Assurance Project Plan
TID	Tamper Indicating Device
WPS	Welding Procedure Specifications

2.0 Responsibilities

Person/Group	Responsibilities
Group Leader/PMT-3	<ul style="list-style-type: none">• Ensure specifications approved for LANL procurements.
Packaging Engineer	<ul style="list-style-type: none">• Ensure the proper codes, standards, and requirements implemented in the procurement specification.

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2.0 Responsibilities, Continued

Person/Group	Responsibilities
Requester	<ul style="list-style-type: none">• Initiate procurement of the NG SNMC in accordance with LANL purchasing requirements.• Provide with the purchase request the following:• Quality Assurance Supplement Form 838c• Procurement design• Receipt Inspection plan NMT4-IP-001.
Procurement Specialist	<ul style="list-style-type: none">• Ensure the inclusion of specified documents in purchase orders/contracts.• Ensure that procurement documents include the appropriate supplier quality clauses from Form 838c, Quality Assurance Supplement.• Ensure purchase order award to suppliers on the IESL for ML-1 and ML-2.
Supplier	<ul style="list-style-type: none">• Provide all NG SNMCs in accordance with contractual documents• Obtain the Procurement Specialist's approval on any exceptions or variations to the purchase order or this specification prior to proceeding with design activities.
Quality Representative	<ul style="list-style-type: none">• Assist in the development of quality assurance criteria, specifications, and inspection/test plans• Review and approve procurement documents to ensure that quality requirements specified and appropriate• Support supplier evaluations• Assist in source inspections, as needed• Assist in receipt inspections, as needed

3.0 Requirements

3.1 General

The Supplier shall address container design concerns with radiolytic and thermal degradation, oxidative expansion, pressurization, usage (handling), and incompatible materials that may result in container failure.

The Supplier shall ensure that, in general, the NG SNMC exhibits compatibility with stored material and the surrounding environment, including any product of reaction between the environment and the material.

The performance and design features for the NG SNMC mitigate the design basis accidents for drop, fire, deflagration and corrosion to failure.

3.2 Performance for Design Qualification

3.2.1 Pressure Criteria

The Supplier shall

- design and rate the NG SNMC, as a minimum, for a normal operating pressure of 14.7 psig @ 75° F;
- document for each NG SNMC, for design qualification only, a hydrostatic pressure test at 1.5 times the minimum operating pressure; and
- perform the test in accordance with the ASME Code, Section III, Division 1, Subsection NB, Article NB6000 testing.

3.2.2 Hydrostatic Pressure Test Acceptance Criteria

The Supplier ensures that the containment boundary shows no visual indication of a leak.

Continued on next page

3.0 Requirements, Continued

3.2.3 Drop Test Criteria

The Supplier shall

- structurally evaluate and test the NG SNMC for impact resistance and material containment when dropped from 1.5 times the maximum working or storage height of 11 feet;
- orient the containers so as to suffer maximum damage to the tested safety features. Simulated contents must represent the actual mass (i.e., maximum gross weight) and the most dispersible contents (i.e., modified from 49 CFR 173.465);
- ensure package equilibrium at an ambient temperature in the range of 75 to 85 degrees F prior to testing;
- shall perform and document the drop tests for three containers of each size container;
- plug the filter prior to test to result in greater stress on the package, as a worst case scenario; and
- provide a flat, essentially unyielding horizontal surface, target for the free drop test.

3.2.4 Drop Test Acceptance Criteria

See section 3.4.5 (p. 14) for complete design qualification, leak-test requirements to be verified both pre-test and post-test.

3.2.5 Fire Test Criteria

The Supplier shall

- expose the whole NG SNMC for not less than two hours to a heat flux not less than that of a radiation environment of 500°C (932°F)- (i.e., safety basis Fire hazard analysis- O 2002 FHA); and
- ensure that the bounding test matrix includes 200 g as plastics and 400 g as cellulose to conservatively address gas generation that could result in a pressurized release and/or plugging of the vent during heating.

NOTE: LANL approves surrogates for PuO₂.

Continued on next page

3.0 Requirements, Continued

3.2.6 Fire Test Acceptance Criteria

The Supplier shall design the container to provide containment of 99% of the surrogate materials (i.e., a release of less than 0.01 of surrogate material [DR=.01]). Alternatively, the Supplier may establish an equivalent leakage rate based on an allowable material release of 0.01 by applying the methodology in ANSI N14.5 or otherwise meet ANSI N14.5 “Leak Tight” Criteria.

3.3 Design Features

3.3.1 Containment

The Supplier shall

- define the containment boundary and ensure that all components, seals, and filters that maintain containment, as minimum, demonstrate a design life of five years; and
- specify and document the design life of limited life components.

3.3.2 Payload Heat Resistance

The Supplier, in the container design, shall address thermal loading and decay heat up to 25 Watts based on maximum HS-Pu content of 50 grams and ensure that the heat generation of the contents does not degrade any of the components that comprise the containment boundary for the design life of the container.

3.3.3 Corrosion Resistance

The Supplier shall construct the components comprising the containment boundary entirely of materials resistant to corrosion or chemical degradation by the contained materials at an ambient storage environment of 75 to 85 degrees F, e.g., salts picking up moisture and corroding the can, Water, Nitric acid, Hydrochloric acid, Hydrochloric gas, Hydrofluoric acid etc.

Continued on next page

3.0 Requirements, Continued

3.3.4 Radiation Resistance

The Supplier shall ensure that components of the NG SNMC that comprise the containment boundary address degradation from radiation effects- α , γ , n. Radiation must not challenge the integrity of the containment boundary for the container's design life.

3.3.5 Dimensions

The Supplier shall design the NG SNMCs with the following dimensions:

Approximate Size	Minimum Inside Diameter
1 quart	4"
3 quart	5 1/2"
5 quart	6 1/2"
8 quart	7 5/8"
12 quart	8 5/8"
5 gallon	11 1/4"
10 gallon	14"

These sizes demonstrate consistency with containers currently in use with internal cavity diameter requirements needing preservation.

3.3.6 Nesting

Supplier shall ensure that each NG SNMC nests within the next larger sized container, (e.g., a 1 quart nests within a 3 quart, and a 3 quart nests within a 5 quart, etc.).

Continued on next page

3.0 Requirements, Continued

3.3.7 Gross Weight

The Supplier shall designate the maximum gross weight (container with payload) of the NG SNMCs as follows:

Approximate Size	Maximum Gross Weight (lbs)
1 quart	4
3 quart	14
5 quart	21
8 quart	28
12 quart	35
5 gallon	40
10 gallon	65

3.3.8 Filter Performance

The Supplier shall vent the containment boundary to prevent pressure buildup and allow for gas release at a hydrogen diffusivity rate of 2.4×10^{-5} mol H₂/s/H₂mol fraction (e.g., NFT-19 Filter or equivalent). The filter remains an integral part of the container.

See 3.4.6 (p. 14) for filter efficiency requirements.

3.3.9 Closure

The Supplier shall design the NG SNMC closure with the following criteria:

- Throat diameter compatible with specified minimum internal diameter as defined in 3.3.5
- Positive closure mechanism to ensure that the lid remains in a sealed position, i.e., securely closed in a way that precludes accidental opening or breaching during normal operations, which includes lifting and carrying
- Effectively demonstrates ALARA by allowing for ease in opening/closing. For example multiple bolt closures would be unacceptable.
- Reproducibility to maintain containment during normal handling

Continued on next page

3.0 Requirements, Continued

3.3.10 Handling

The Supplier shall incorporate into the NG SNMC lift points possessing a minimum safety factor of three (3) against yield (i.e., based on maximum gross weight of the NG SNMC sizes).

3.3.11 TID

The Supplier shall ensure that the NG SNMC accommodates the correct application of a LANL TID cup seal.

NOTE: Once a TID is applied to the lid and container, removing the lid from the container damages the TID.

3.4 Fabrication

3.4.1 Fabrication

The Supplier shall perform fabrication of the NG SNMC in accordance with the Supplier's LANL approved, Department of Energy (DOE) compliant, Quality Assurance Program (QAP) based on the requirements of NQA-1 2004, *Quality Assurance Requirements for Nuclear Facility Applications*, Part I; 10 CFR 830.122, *Nuclear Safety Management*, Subpart A, *Quality Assurance Requirements*; and DOE Order 414.1C, *Quality Assurance*.

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3.0 Requirements, Continued

3.4.2 Welding

The Supplier shall

- ensure that a certified welder or welding system performs all welding and follows the guidance contained in the *LANL Engineering Standards Manual OST220-03-01-ESM*, Volume 1, General Welding Standards, *GWS 1-09 – Control of Subcontracted Welding* (refer to the following URLs for additional information:
 - <http://www.lanl.gov/f6stds/pubf6stds/engrman/13weld/pdf/1-09%20Procedure-R0.pdf>
 - <http://www.lanl.gov/f6stds/pubf6stds/engrman/13weld/pdf/1-09-Att.1-R0.pdf>
 - http://www.lanl.gov/f6stds/pubf6stds/engrman/13weld/pdf/1-02_Procedure-R0.pdf
 - <http://www.lanl.gov/f6stds/pubf6stds/engrman/13weld/pdf/1-03%20Procedure-R0.pdf>);
- ensure the qualification of welding procedures and personnel in accordance with ASME Code, Section IX and make welding procedures and welder qualifications available for audit or review;
- visually examine welds in accordance with AWS D1.1; and
- ensure that visual weld inspectors are qualified per AWS D1.1.
- weld with liquid penetrant inspected on root and final passes, if a multiple pass weld, and on the completed weld, if a single pass weld, in accordance with ASME Code, Section III, Division 1, Subsection NB, Article NB-5000 and Section V, Article 6
- Provide WPQR and WPS to LANL for approval prior to fabrication

3.4.3 Cleaning

The Supplier shall clean and passivate stainless steel parts per A380-99(2005) *Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems*.

Continued on next page

3.0 Requirements, Continued

3.4.4 Water Shedding

The Supplier shall ensure that every closed and sealed container sheds water

3.4.5 Leak Testing

The Supplier shall leak test the NG SNMC containment boundary as follows:

- Leakage rate test meets “Leak Tight” per ANSI N14.5, i.e., a helium leakage rate less than or equal to $1.96 \times 10^{-7} \text{ cm}^3/\text{sec}$ at an upstream pressure of 1 atm. abs and a downstream pressure of 0.01 atm abs or less
- Leak test procedures meet the American Society for Testing and Materials (ASTM) E493, Standard Test Methods for Leaks Using the Mass Spectrometer Leak Detector in the Inside-Out Mode
- The sensitivity of the leakage rate test procedure is 5×10^{-8} scc/s, air, or less, per Section 8.4, Sensitivity, of ANSI N14.5
- Leak Testing Specialists approve the Supplier’s helium leak-test procedure and personnel certification procedure. NOTE: Contact Leak Testing Specialists at 5790 Hoffner Ave. Suite 505, Orlando, FL. 32822-4801, (407) 737-6415, (fax) 737-6416, email: info@leaktestingspec.com
- The helium leak test conducted after the hydrostatic pressure test identified in 3.2.1 for design qualification and also on 100% of production
- Performed by a Level II helium leak tester according to the American Society of Nondestructive Testing, *Recommended Practice No. SNT-TC-1A*, using the manufacturer’s certification procedure.

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3.0 Requirements, Continued

3.4.6 Filter Efficiency

The Supplier shall ensure filter efficiency based upon the following criteria:

- A 100% filter efficiency test performed and documented for every lid/filter assembly during manufacture
- Filter delivers a minimum of 200 ml/min of air at no more than 1.0 inch water column pressure differential
- Filter captures greater than 99.97% of 0.45 micron mean diameter DOP aerosol at the rated flow
- Concentration of DOP is 65 +/- 15 micrograms per liter
- Filter prevents water entry up to 12" water column

3.4.7 Surfaces

The Supplier shall ensure that

- the outside surface of the container lid and body exhibit a 125μ finish or better; and
- the inside surface of the lid and body demonstrate a 63μ finish or better

3.0 Requirements, Continued

3.5 Marking

3.5.1 Serial Number

The Supplier shall mark the containers with serial numbers in the following manner:

- Use 22 pt.as a minimum font size for the serial number on these containers
- Serial numbers indicate the following:
 - date of manufacture (mm/yy),
 - size of the container, and
 - unique serial number
- Format as follows: mm/yy – SSUUU (SS is the container size, (UUU is the unique serial number), (examples: 05/02-05024 or 05/02-08024)
- Do not use duplicate date and serial number combinations
- Start the serial numbers for each size of container and batch with -001
- Use the same serial number identification for lid, body filter

3.5.2 Container Identification Label

The Supplier shall use a continuous label located on the outside rim of each lid that identifies the container and filter type, ensuring readability from the side in any direction.

3.5.3 Barcode

The Supplier shall locate a barcode on the same side as the serial number and use a barcode reader to read etched barcodes to ensure 100% readability of barcodes.

3.0 Requirements, Continued

3.6 Quality

3.6.1 Right of Access

The Procurement Specialist and the Requester shall possess a right of access to the Supplier's facility to witness fabrication and test activities and to perform assessments and source examinations, as required.

3.6.2 Quality Assurance Program

The Supplier shall design, manufacture, and test NG SNMCs in accordance with a formal Quality Assurance Program, approved by LANL, that complies with the following DOE QAP requirements:

- NQA-1 2004, ASME Quality Assurance Program Requirements for Nuclear Facilities, Part I (National Consensus Standard)
- 10 CFR 830.122, Nuclear Safety Management, Subpart A, Quality Assurance Requirements (Rule)
- DOE Order 414.1C, Quality Assurance (Order)

The Supplier shall also comply with any supplemental quality clauses identified within the LANL contract.

3.6.3 Quality Assurance Project Plan

The Supplier shall prepare a requester-approved, project-specific Quality Assurance Program Plan (QAPP), describing how the Supplier performs work activities in accordance with DOE Quality QAP requirements

3.6.4 Design Review

The Supplier shall send all design drawings to the Requester for independent review and approval

3.6.5 Approved Design

The Supplier shall manufacture containers based on approved drawings and specifications only. The Requester (i.e., the PMT-3 technical representative) maintains approval signature, therefore the signature on a drawing or specification indicates approval.

3.0 Requirements, Continued

3.7 Shipping Provisions

The Supplier shall prepare the NG SNMCs for shipment by banding, palletizing, and stretch-shrink wrapping, as appropriate. The Supplier shall optimize NG SNMC quantity per pallet.

4.0 Required Records

4.1 Submittals The Supplier shall submit the following design basis and test documents to the Requestors technical representative for approval for all the NG SNMC configurations. The Supplier may submit a milestone schedule for document approval by the Procurement Specialist. Unless otherwise approved by the Procurement Specialist, the Supplier shall submit all submittals for approval by Requestors technical representative prior to the delivery of the NG SNMC production units.

4.1.1 Design Basis Drawings

The Supplier shall submit design-basis drawings adequately detailed to convey the configuration of the NG SNMCs, which include as a minimum,

- a listing of components and materials,
- governing specifications,
- detail dimensions,
- weld-joint configuration,
- inspection requirements,
- design pressure and temperature ratings,
- leak-test acceptance criteria,
- critical assembly criteria, and
- other applicable elements.

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4.0 Required Records, Continued

4.1.2 Design Basis Specifications

The Supplier shall submit design basis specifications adequately detailed to convey the construction standards for the NG SNMC, which address, as a minimum,

- materials of construction,
- fabrication procedures,
- inspection and test procedures,
- qualifications of welders and inspection personnel, and
- other applicable elements.

4.1.3 Design Calculations

The Supplier shall submit approved and professional-engineer stamped design calculations that demonstrate compliance with this specification.

4.1.4 Test Plans/Reports

The Supplier shall submit test plans/reports documenting the performance tests specified in Section 3.2, which identifies NG SNMC acceptance leak testing and hydrostatic testing requirements.

4.1.5 Opening and Closing Instructions

The Supplier shall submit NG SNMC opening and closing instructions.

4.1.6 Design Evaluation

The Supplier shall submit a design evaluation document that elaborates on how all the performance requirements of this specification are met.

4.1.7 Maintenance Instructions

The Supplier shall submit all appropriate maintenance instructions.

4.0 Required Records, Continued

4.2 Records

4.2.1 Certificate of Conformance

The Supplier shall provide a Certificate of Conformance (CoC) for each NG SNMC that refers to

- the LANL purchase order number,
- the current revision of drawing(s) or approved changes,
- and the most current revision of PMT-3 Specifications.

The CoC, at a minimum, shall include a statement signifying compliance with

- the Procurement Specialist's purchase order,
- this procurement specification, and
- the applicable ASME B&PVC requirements.

An authorized representative of the Supplier shall sign the CoC.

4.2.2 Data Package

The Supplier shall provide a manufacturing data package for each fabricated NG SNMC that includes, as a minimum, the following:

- drawings
- inspection reports
- calculations
- Welding Procedure Specifications (WPS)
- Procedure Qualification Report (PQR)
- Certified Material Test Reports (CMTR), showing the material's heat number or other unique number, for every container part, including filler material for welds and each type of O-Ring used
- Certificate of Analysis for filter material
- test data and records
- nondestructive examination reports
- inspection personnel certifications

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4.0 Required Records, Continued

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- | | |
|-------------------------|---|
| 4.2.2
(Cont.) | <ul style="list-style-type: none">• Other recorded data as necessary to demonstrate compliance• Supplier's Routing Sheet or Traveler• WPQRs for personnel performing welding operations on each type of weld performed, per ASME Code Section IX (NOTE: The Supplier shall ensure the annual update of the welder's certification, including the LANL-approval documentation for the welder.)• weld maps per container lot• weld inspection reports per lot• lid/filter assembly filter efficiency test data• surface finish data, inside and outside |
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5.0 References

Document Number	Title
N/A	ASME B&PVC, Section VIII, Division 1, Rules for Construction of Pressure Vessels.